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ABSTRACT

A study examined which agricultural mechanics skills were being taught by vocational horticulture teachers in Pennsylvania and compared the degree of proficiency possessed by teachers for particular competencies with the indicated relative importance of these competencies as perceived by employers in the horticulture industry. Also examined were the effect of sex, years of teaching experience, and place of employment on the agricultural mechanics proficiency of vocational teachers. A mailed questionnaire, designed to collect demographic data and information pertaining to 171 agricultural mechanics competencies was completed by 85 teachers and 17 employers. After determining which competencies were considered most essential according to the perceptions of the employers, researchers discovered that while a majority of horticulture teachers were teaching the correct mechanics competencies in relation to relative importance, only 10 of the 55 essential competencies were being taught by 70 percent or more of the teachers. In addition, teacher proficiency was found to be undesirable in many areas perceived as important by employers. Recommendations included calls for inservice courses in agricultural mechanics for vocational horticulture teachers as well as for development of related curriculum materials for horticulture teachers. (MN)

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FINAL REPORT

**INSTRUCTIONAL STATUS OF AGRICULTURE MECHANICS
BY PENNSYLVANIA HORTICULTURE TEACHERS
(Contract Number 83-0802)**

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Pennsylvania State University

University Park, PA

November 12, 1981

PENNSYLVANIA DEPARTMENT OF EDUCATION

BUREAU OF RESEARCH AND EVALUATION

**RESEARCH COORDINATING UNIT
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PREFACE

The author wishes to express his sincere thanks to his advisor, Dr. Richard F. Stinson, Professor of Agricultural Education and Horticulture, for his help and guidance in the development and completion of this research.

Appreciation is extended to Dr. Edgar P. Yoder, Assistant Professor of Agricultural Education, and Dr. James W. Hilton, Assistant Professor of Agricultural Engineering and Agricultural Education, members of the committee, for their advice and counsel in the completion of this research.

Special thanks is extended to vocational agriculture teachers and horticulture businesses in the state for their time and effort in responding to the survey instrument.

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INTRODUCTION

Abstract

Vocational horticulture teachers today need to possess proficiency in certain agricultural mechanics competencies in order to best prepare students for the world of work. In the past, horticulture teachers did not, and would not, need to teach either basic or specialized agricultural mechanics.

The purpose of this study was to ascertain if any agricultural mechanics were being taught, whether the competencies being taught should be taught, and the degree of proficiency at which mechanics competencies were being taught. The study was conducted by surveying vocational horticulture teachers and horticulture businesses. The teachers' responses to the agricultural mechanics competencies centered upon their proficiency while the businesses' responses were related to the importance of the competency for success in their particular enterprises.

It was found that horticulture teachers in Pennsylvania were in fact teachers of agricultural mechanics; statistical analysis of the data indicated agricultural mechanics being taught at limited levels prior to assigning any importance to the competencies. After importance values were calculated from the business input, it was found that a majority of horticulture teachers was teaching a majority of the "most important" agricultural mechanics competencies. Instruction in agricultural mechanics by vocational horticulture teachers was being provided in the proper mechanics areas.

However, instruction at a less than optimum level was being provided in relation to the importance assigned by the horticulture industry. There was a significant difference between teacher proficiency and business importance for 14 of the 15 "most essential" competencies and 18 of the 55 "essential"

agricultural mechanics competencies. Although they were teaching the correct mechanics instructional areas, horticulture teachers need to further develop their agricultural mechanics expertise.

Secondary objectives of the study dealt with the effect of sex, years of teaching experience, and place of employment on the proficiency levels of the horticulture teachers. Of the three, only sex accounted for significant differences in proficiency levels for a majority of the agricultural mechanics competencies. The null hypotheses were rejected for a total of 105 of the 171 competencies. The number of years of teaching experience accounted for rejection of the null hypotheses for only 14 of the competencies; whereas, 28 of the competencies had significant differences for the variable place of employment.

Recommendations based on this study include immediate and long range inservice course offerings in agricultural mechanics for vocational horticulture teachers as well as the development of curriculum materials in agricultural mechanics for horticulture teachers in Pennsylvania.

Restatement of the Problem

The purpose of this study was to ascertain what agricultural mechanics competencies were being taught by vocational horticulture teachers in Pennsylvania, and to compare the degree of proficiency possessed by teachers for particular competencies with the indicated relative importance of these same mechanics competencies by the horticulture industry. A secondary purpose of the study was to determine the effect of sex, years of teaching experience, and place of employment on the agricultural mechanics proficiency possessed by vocational horticulture teachers.

Although the original proposal called for inclusion of pre-service teachers in the study, it was decided jointly by the author and advisory

committee at the Pennsylvania State University to narrow the scope of the study to in-service teachers and concentrate on more specificity by including the horticulture industry.

METHODS

Objectives of the Study

In order to meet the purposes of the study, the following specific objectives were identified:

1. To determine what agricultural mechanics competencies were being taught by vocational horticulture teachers in Pennsylvania.
2. To identify a component core of agricultural mechanics competencies for all specialty areas of vocational horticulture.
3. To identify component cores of agricultural mechanics competencies for the different vocational horticulture specialty areas.
4. To determine the vocational horticulture teachers' level of proficiency in agricultural mechanics competencies considered important by the horticulture industry.
5. To determine if the agricultural mechanics competencies being taught by vocational horticulture teachers are those considered important by the horticulture industry.
6. To better determine the number and scope of vocational horticulture programs in Pennsylvania.
7. To determine the effect of sex, teaching experience, and place of employment on vocational horticulture teachers' level of proficiency in agricultural mechanics.

Hypotheses of the Study

The hypotheses to be tested were:

1. There is no significant difference in the level of agricultural mechanics needed and that developed by teachers of vocational horticulture.
2. There is no significant difference between beginning and experienced teachers of vocational horticulture in the level of agricultural mechanics competencies developed.
3. There is no significant difference between male and female vocational horticulture teachers in the level of agricultural mechanics competencies developed.
4. Vocational setting makes no significant difference in the level of agricultural mechanics competencies developed by teachers of vocational horticulture.

Procedures of the Study

The procedures used to achieve the stated objectives consisted of four steps; these included:

- (a) development and validation of the agricultural mechanics competency list
- (b) development of the survey instrument
- (c) administration of the survey instrument
- (d) collection of data

The development and validation of the agricultural mechanics competency list was done over a period of several months with input from several sources. Prior works, the faculty in the Horticulture Department at the Pennsylvania State University, horticulture teachers in the field, and the author himself contributed to the development of the final list. Validation of the compe-

tencies come from the horticulture industry with various horticulture businesses indicating the importance of each competency.

The survey instrument consisted of the list of agricultural mechanics competencies, an introduction to the study, and a demographic data survey developed to obtain pertinent information from each respondent to be used in later statistical analysis. The instrument and overall project was reviewed and approved by the Human Subjects Review Board at The Pennsylvania State University. The survey instrument was disseminated by mail on April 2, 1981. The mailing included a representative sample of vocational agriculture teachers teaching at least a partial horticulture curriculum as well as randomly selected horticulture businesses.

To insure a good return rate, non-respondents received two follow-up letters and contact by phone if necessary. There was a 76% response rate for the study. This can be broken down into 85 of 104 teachers and 17 of 31 horticulture businesses.

ANALYSIS

Data Analysis of Objectives and Hypotheses

Hypotheses 1, 2, and 3 were tested the following way. Means for each of the 171 agricultural mechanics competencies were calculated for both teacher proficiency and horticulture business importance. The non-paired t-test was employed for analysis of mean differences in each of the three hypotheses. The 0.05 level of significance was the critical standard.

Hypothesis 4 was tested using a single classification analysis of variance program. When significant F-ratios were noted, a Duncan's Multiple Range Test was used to identify significantly different means. The 0.05 level of significance was again the critical standard.

All objectives related to the current status of agricultural mechanics by vocational horticulture teachers was done through frequency counts and deviation of the appropriate percentages.

CONCLUSIONS AND RECOMMENDATIONS

Outcomes of Objectives and Hypotheses

Agricultural Mechanics Competencies Being Taught. The agricultural mechanics competencies being taught with the highest percentage of current instruction involved spraying and spreading equipment. This was followed by those competencies dealing with fitting and repairing digging, tree, and grass cutting tools.

Without dealing with relative importance of the mechanics competencies as perceived by industry, the findings indicated that 118 of the 171 competencies were being taught by 50 percent or less of the teachers. Only 21 of the competencies were being taught by 70 percent or more of the teachers.

Agricultural Mechanics Competencies Being Taught in Relation to Business Importance. The relationship between the agricultural mechanics being taught and the relative importance of each was also examined. Importance means as determined by industry were calculated for all competencies included in the study. Overall, the horticulture industry placed most emphasis on those competencies involving agricultural tractors/nursery related equipment and spraying/spreading equipment. All competencies were categorized according to their overall mean. The following system was used.

<u>Category</u>	<u>Mean</u>	<u>Number of Competencies</u>
Most essential	2.74-2.25	55
Essential	>2.75	15
Somewhat essential	2.24-1.75	87
Not essential	<1.75	14

With importance established, the question of whether these competencies were being taught was next addressed. With 70 percent assigned arbitrarily as the lowest limit on an acceptable teaching percentage, results indicated ten of the most essential competencies being taught by 70 percent or more of the teachers. Only 10 of the 55 essential competencies were being taught by 70 percent or more of the teachers. Looking at the breakdown using 50 percent as the lowest acceptable teaching percentage, results indicated 42 of the 70 competencies with a mean of 2.25 or higher were being taught. It appeared that a majority of horticulture teachers were teaching the correct mechanics competencies in relation to importance.

Teacher Proficiency in Relation to Business Importance, Sex, Years of Teaching, and Place of Employment. Teacher proficiency in relation to business importance was undesirable as a whole. As mentioned, data from this study indicated that selected areas of agricultural mechanics were considered particularly important by the industry. Although proficiency levels were reported high for certain areas of mechanics, they were not satisfactory in relation to business importance. Of the 15 mechanics competencies categorized most essential, there was a significant difference 14 times between proficiency and importance. Eighteen agricultural mechanics competencies categorized as essential were significantly different between teacher proficiency and business importance.

Regarding the influence of sex on teacher proficiency, the findings indicate that male teachers were more proficient than female teachers a majority

of the time. A significant difference in the proficiency level between male and female teachers was found in 105 of the 171 competencies.

Differences in proficiency due to years of teaching experience were minimal. The number of years of teaching experience in relation to teacher proficiency showed significant difference between beginning and experienced teachers in only 14 cases. There was a significant difference between the two groups for only one of the 15 most essential competencies.

The study of place of employment resulted in significantly different proficiency levels for 28 of the 171 mechanics competencies. The Duncan's Multiple Range Test indicated the differences were between special/other programs and comprehensive high schools/vocational technical schools.

Recommendations

1. Inservice agricultural mechanics course offerings in the areas of agricultural tractors/nursery related equipment and spraying/spreading equipment; these offerings should be geared specifically to vocational horticulture teachers.
2. Workshops to impress upon vocational horticulture teachers the role, importance, and implication of agricultural mechanics for vocational horticulture.
3. Agricultural education majors who are specializing in horticulture be given an agricultural mechanics course offering that is horticulture oriented.
4. A thorough study be made of existing curriculum materials pertaining to agricultural tractors/nursery related equipment and spraying/spreading equipment. Revisions should be made if necessary.

5. Development of manual consisting of horticultural mechanics instructional units for field testing in Pennsylvania.
6. Publication of research findings to better inform vocational horticulture teachers.

Recommendations for Further Research

On the basis of this study, the following recommendations are being made:

1. A separate, more extensive study be made to determine only the importance of the agricultural mechanics competencies surveyed and any competencies that may arise or that have been overlooked.
2. After a more comprehensive study has been completed identifying the importance of agricultural mechanics competencies for the horticulture industry, curriculum materials and teaching aids relevant to agricultural mechanics should be made available for classroom use for vocational horticulture teachers.

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